ELECTRO-METRICS
A DIVISION OF PENRIL CORP.
100 Church St., Amsterdam, New York 12010

OPERATING INSTRUCTIONS

FOR

REMOTE VERTICAL ANTENNA

MODEL RVR-25

The RVR-25 was designed for use with our EMC-25 Receiver but can be used with any receiver with 50 ohm impedance. Provision must be made to supply voltages to the antenna to switch the impedance matching transformers (10) in the antenna base. The 10 position switch in the antenna requires 12 volts.

Serial Number: 8-09

Electro-Metrics Division
Penril Corp.
100 Church Street
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1.0 GENERAL

Remote Vertical Antenna, Model RVR-25, is designed specifically for use with Electro-Metrics Division Interference Analyzer, Model EMC-25. Model RVR-25 covers the same frequency range (10 kHz - 30 MHz) as the first ten RF bands of the EMC-25 and is automatically switched for optimum operation at the particular EMC-25 RF band selected.

Model RVR-25 is designed for use in conjunction with Counterpoise, Model GPA-25, Tripod, Model TRP-25, and Coaxial Cable, CAC-25, and is furnished with a 25-foot length of control cable for connection to the EMC-25.

2.0 PRINCIPLE OF OPERATION

Remote Vertical Antenna, Model RVR-25, is basically a 41-inch rod. As is the case with any remote rod antenna, optimum transfer of an intercepted signal to the receiver (in this case, the EMC-25) over 50-ohm cable requires that the rod be fed to an impedance transformation network. Since it is feasible to optimize this network for no more than approximately octave segments of its frequency range, it is necessary to switch networks in order to cover the more-than-ten-octave range of 10 kHz - 30 MHz.

As is the case in conventional remote antennas, the matching networks are mounted in the base of the antenna. However, rather than a manual ten-position switch as would be used with a conventional remote antenna, the Model RVR-25 utilizes a rotary solenoid switch controlled remotely from the Model EMC-25 Interference Analyzer.

The particular RF band to which the EMC-25 is set is indicated by digital logic on four of the leads in the remote control cable. In the base of the RVR-25 antenna logic circuits compare the coding on these leads (+12 volts = "1") to the coding inside the base which indicates which matching network is actually switched in at that moment. If the coding indicating the EMC-25 RF band selected differs from this internal coding, the rotary solenoid is activated and runs until the codes agree. Thus, regardless of which of the first ten RF bands of the EMC-25 is chosen, the RVR-25 will automatically switch itself to the optimum matching transformer for that band.

3.0 OPERATING PROCEDURE

3.1 Physical Setup

First, mount the antenna base to the Tripod, Model TRP-25. The antenna base is secured to the tripod by screwing it in a clockwise direction, as viewed from above.

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Next, slip Counterpoise, Model GPA-25, over, and attach it to the top of,the antenna base, screwing the four captivated thumb screws on the counterpoise into the threaded holes provided at the corners of the antenna base.

Finally, screw the rod into its socket and extend to its full 41-inch length.

3.2 Electrical Connections

The 25-foot multiple-conductor cable furnished with the antenna is to be connected between the 9-pin connector on the antenna base and the 34-pin remote connector on the front panel of the EMC-25. The 25-foot coaxial cable is to be connected from the "Signal Out" TNC Connector on the antenna base (nearest the 9-pin connector) to the"RF Input" TNC Connector on the EMC-25 front panel. The other TNC Connector on the antenna base is reserved for use with Automated Spectrum Surveillance System, Model FSS-250.

3.2.1 Checkout

The following simple test will demonstrate that the switching of networks in the base of the RVR-25 correctly corresponds to the respective RF band of the EMC-25:

a. Turn the EMC-25 "Power" switch on (up.)
b. Set the Band Selector Switch on the EMC-25 to the blank band between Band 15 (500-1000 MHz) and Band 1 (10kHz-35kHz).
c. Turning the Band Selector switch clockwise, select Band 1 (10kHz-35kHz). Listen and observe a single clearly-audible "click" in the base of the RVR-25 as Band 1 is selected.
d. Continue to rotate the Band Selector switch, one band at a time, observing that a single "click" accompanies the selection of each succeeding band, including Band 11 (which is beyond the frequency coverage range of the RVR-25.)
e. Observe that no clicks accompany selection of Bands 12, 13, 14 or 15, but that there is again a click when the blank band is again reached.
f. If the RVR-25 fails to exhibit the characteristics described above, immediately contact your local Electro-Metrics Division representative and inform him of the details of the failure.

3.3 Electric Field Measurements

3.3.1 Narrow-Band Radiated Signals

With the Remote Vertical Antenna, Model RVR-25,

connected to the EMC-25 as described above, tune the EMC-25 to the frequency range of interest. Read the two-terminal voltage indicated by the EMC-25 for the particular signal of interest, following the calibration and operating procedures covered by paragraphs 3.7 through 3.9.6 of the EMC-25 Instruction Manual.

To convert a two-terminal reading on the EMC-25 to the appropriate field strength reading when using the RVR-25, simply add the "antenna factor in dB" indicated by the following series of graphs as appropriate to the frequency of measurement.

Example:

Meter scale on EMC-25 reads----------	0 dBuV
Input Attenuator on EMC-25 is set to----------	+20 dBuV
Two-terminal voltage indication is----------	+20 dBuV
Antenna factor from graph (this manual)---------	+40 dB
Field strength intercepted by antenna is--------	+60 dBuV/met

3.3.2 Broadband Radiated Signals

After determining that the signal is truly a broadband signal (see Par. 3.14 of the EMC-25 Instruction Manual), proceed to determine the correct two-terminal broadband level as covered in Par. 3.7 through 3.9.6 of the EMC-25 Instruction Manual.

To convert the resulting two-terminal reading to the appropriate field strength, using the RVR-25, simply add the "antenna factor in dB" indicated by the following graph as appropriate to the center frequency of measurement.

Example:

Meter scale on EMC-25 reads----------	0 dBuV
Input Attenuator on EMC-25 is set to----------	+20 dBuV
Broadband Conversion Factor (from Cal Chart)----	+20 dBuV/MHz
Two-terminal broadband signal level----------	+40 dBuV/MHz
Antenna factor from graph (this manual)---------	+40 dB
Broadband field strength intercepted by RVR-25--	+80dBuV/mete
	MH

3.3.3 Antenna Induced Voltage

Since the effective height of the 41" RVR-25 is one-half meter, antenna induced voltage (open circuit),

$$E_a = E \times h_e, \text{ where}$$

E = field strength (uV/meter determined above), and
h_e = effective height of the RVR-25, equal 0.5 meter.

Thus,

$$E_a = 0.5E, \text{ so}$$

to find antenna induced voltage in uV, simply subtract 6 dB from any field strength reading determined above.

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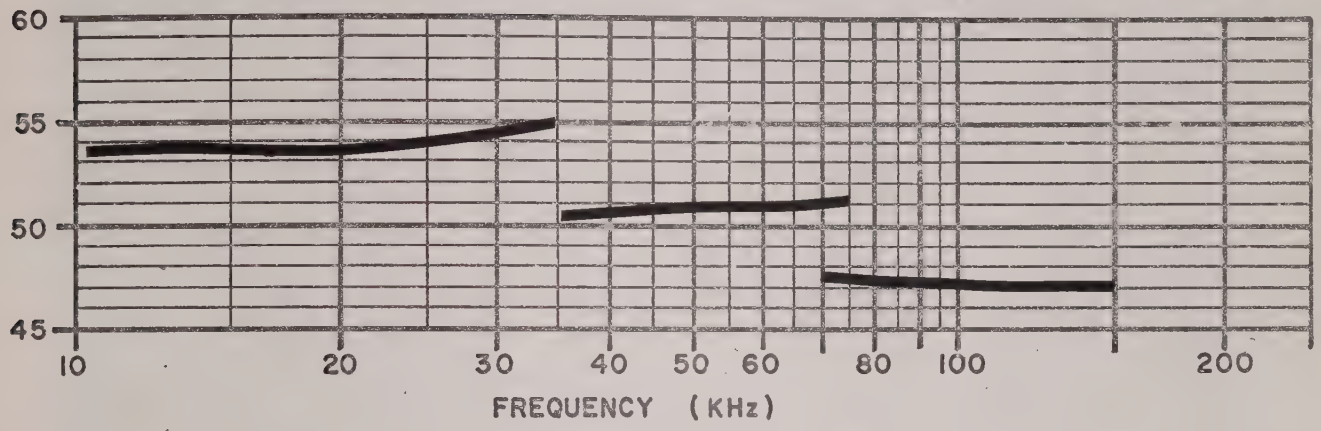
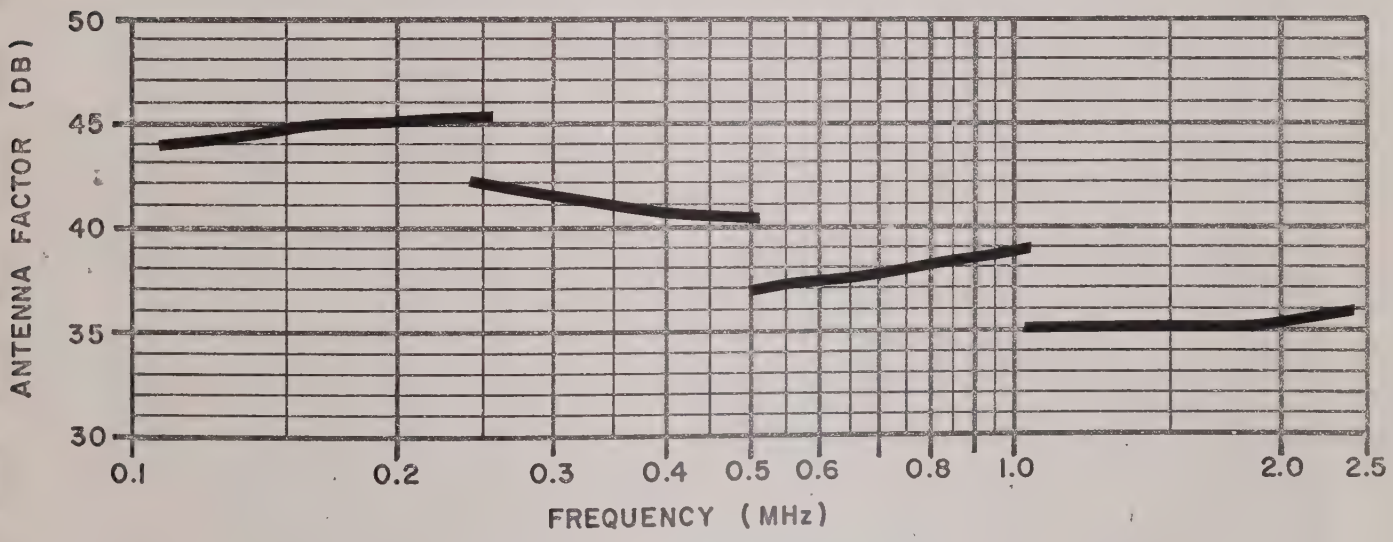
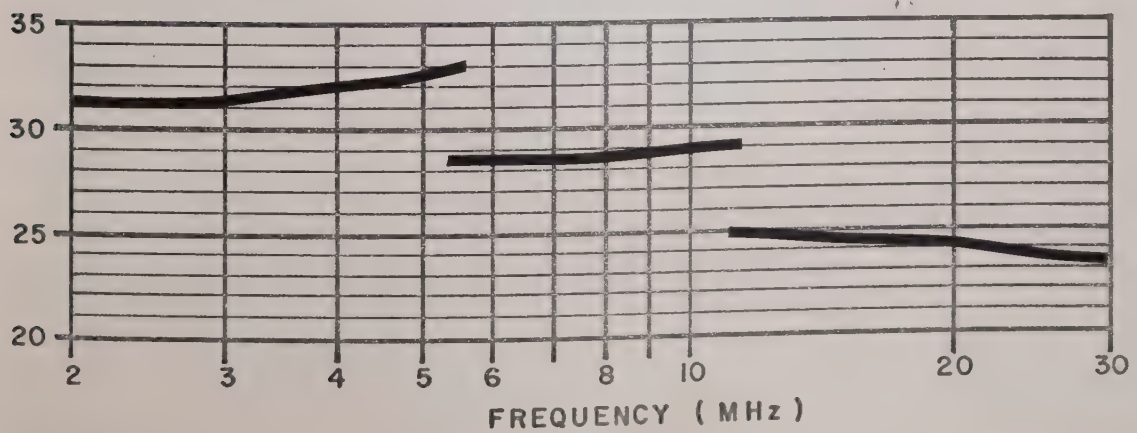
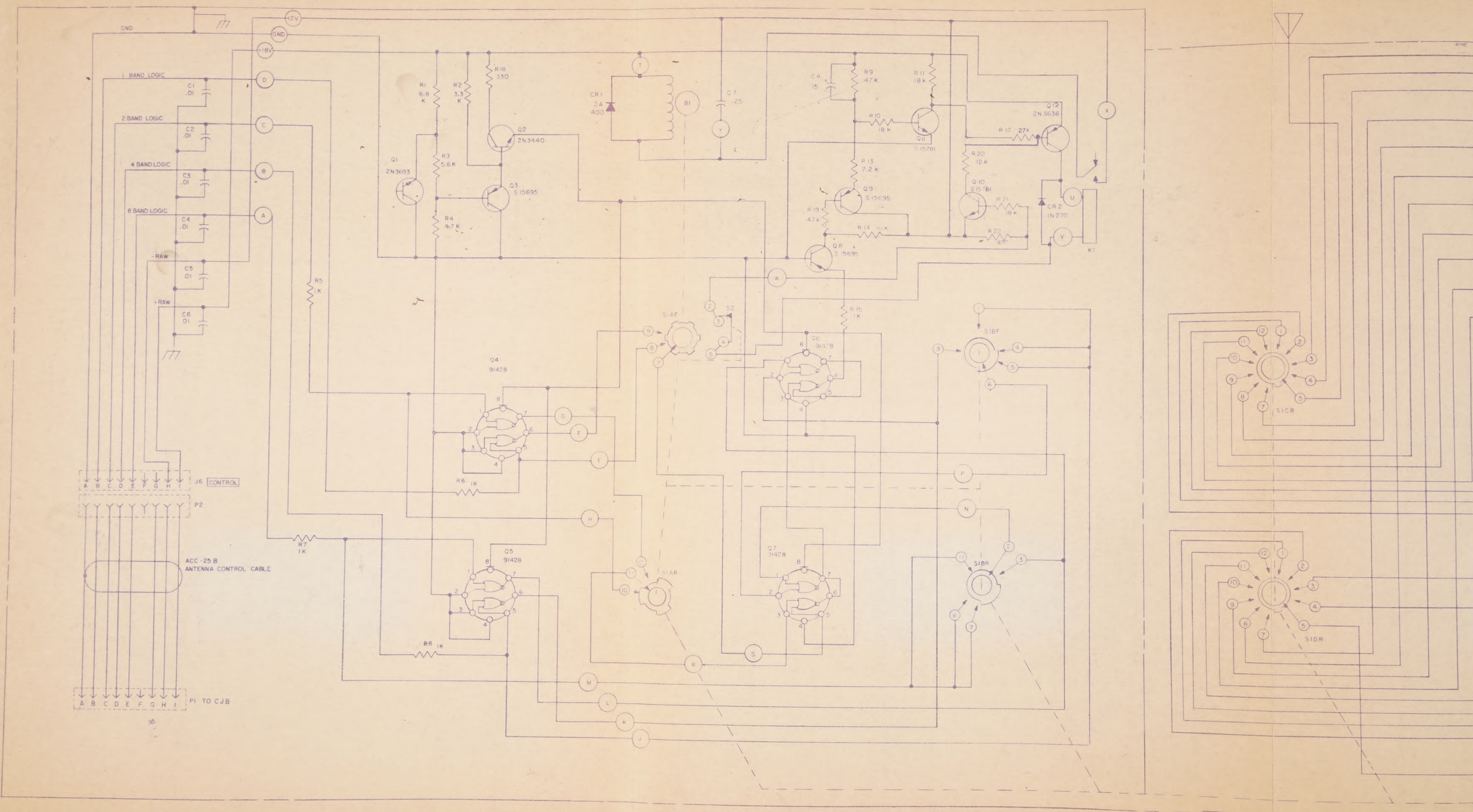
ANTENNA FACTOR CHART
RVR-25

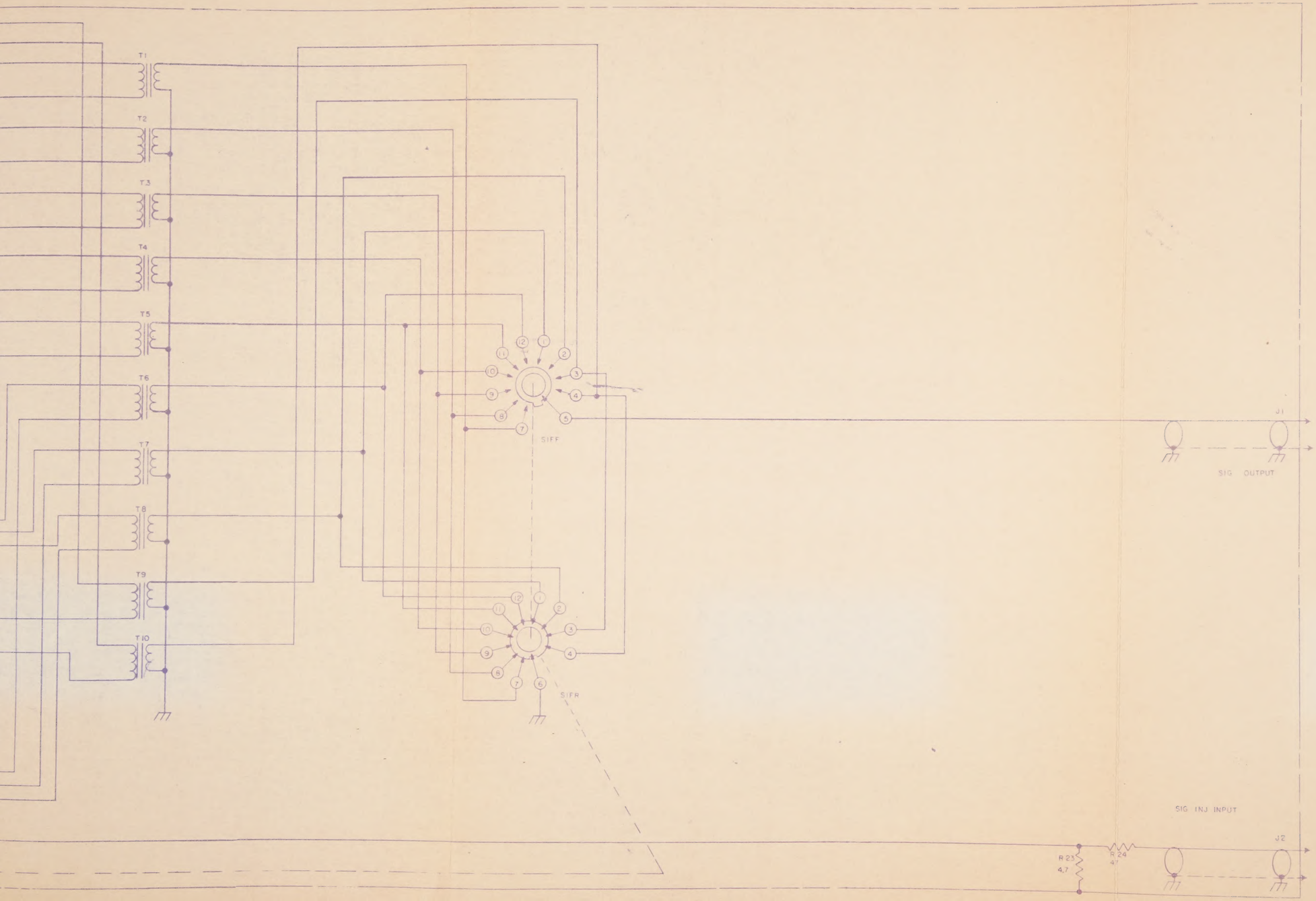
S/N 8-09 DATE 12/09/[illegible]








GND
+12V
GND
+18V
1 BAND LOGIC
2 BAND LOGIC
4 BAND LOGIC
8 BAND LOGIC
-RAW
+RAW
C1 .01
C2 .01
C3 .01
C4 .01
C5 .01
C6 .01
R1 6.8 K
R2 3.3 K
R3 5.6 K
R4 4.7 K
R5 1K
R6 1K
R7 1K
R8 1K
R9 47K
R10 18K
R11 18K
R12 27K
R13 2.2K
R14 10K
R15 1K
R18 330
R19 47K
R20 12K
R21 18K
R22 47K
C7 .25
C8 15
CR1 2A 400
CR2 IN 270
Q1 2N3693
Q2 2N3440
Q3 S15695
Q4 91428
Q5 91428
Q6 91428
Q7 91428
Q8 S15695
Q9 S15695
Q10 S15781
Q11 S15781
Q12 2N3638
B1
K1
S1AF
S1AR
S1BF
S1BR
S1CR
S1DR
S2
J6 CONTROL
P2
ACC-25B ANTENNA CONTROL CABLE
P1 TO CJB



NOTES

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, ±10 %
2. UNLESS OTHERWISE SPECIFIED, ALL CAPACITOR VALUES ARE IN MICROFARADS ±20 %
3. UNLESS OTHERWISE SPECIFIED, ALL INDUCTANCE VALUES ARE IN MICROHENRIES
4. COMPONENTS MARKED * ARE FACTORY ADJUSTED
5. ALL SWITCHES ARE SHOWN IN BAND X POSITION, FIRST POSITION CLOCKWISE IS BAND 1
6. (a) LAST C NO.– C8
   (b) LAST R NO.– R 24
   (c) LAST Q NO.– Q 12
   (d) LAST T NO.– T 10
   (e) LAST CR NO.– CR 2

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